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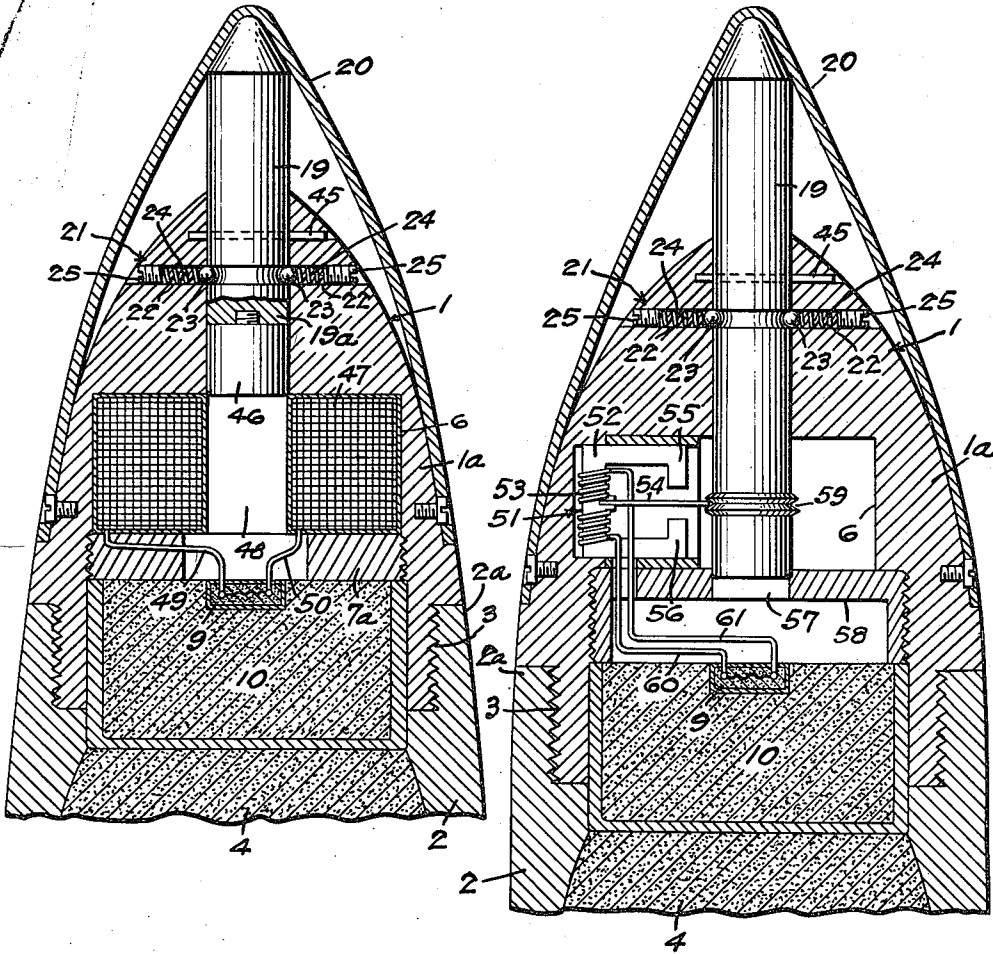
POINT DETONATING FUSE

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Fig. 4.

Fig. 5.



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POINT DETONATING FUSE

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3 Claims. (Cl. 102—70.2)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to point detonating fuses and more particularly to an electric point detonating fuse for explosive missiles.

An object of the invention is a point detonating fuse having electrical means responsive to impact of the missile with a target to actuate the detonator of the fuse.

Another object of the invention is an electric point detonating fuse of high reliability and of simple design which readily lends itself to mass production methods.

Another object of the invention is an electric point detonating fuse which will not arm until the explosive missile has been fired or launched.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from the following description and drawings in which:

Fig. 1 is a longitudinal cross-sectional view of a preferred embodiment of the invention;

Fig. 2 is a transverse sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is a longitudinal cross-sectional view of a modification of the invention;

Fig. 4 is a longitudinal cross-sectional view of another modification of the invention;

Fig. 5 is a longitudinal cross-sectional view of another modification of the invention.

Referring to the drawings by characters of reference and more particularly to Figure 1 in which is shown a fuse 1 for explosive projectiles comprising a body member 1a having electrical energy generating means therein. The body is assembled to the nose 2a of the projectile 2 in a conventional manner as indicated by the reference numeral 3. The projectile 2 contains an explosive charge 4.

The fuse body 1 is provided with a longitudinal bore 5 in communication with a chamber 6 formed in the base portion of the body. In the chamber 6 there is positioned electric energy generating means comprising an electromagnetic field winding 7 and a permanent magnet type of armature 8 arranged to oscillate within the confines of the field winding. The winding 7 is locked in the chamber by means of locking ring 7a which may be in threaded engagement with the vertical walls of the chamber and is connected to an electric detonator 9 in a booster charge 10 by means of leads 11 and 12. The booster is positioned in the open end of the chamber 6 and is in intimate contact with the explosive charge 4. The armature 8 is pivotally mounted in the vertical walls of chamber 6 by means of trunnions 13 and is provided with a longitudinal bore 14, having cam surfaces 15 formed therein, in axial alignment with the longitudinal bore 5. The sides of the armature 8 have longitudinal slots 16 formed therein which receive spring bias members 17 having their extremities 17a bearing against the field winding housing 18.

A plunger 19 is slidably positioned in bore 5 at the front end of the body 1 and has a portion thereof extending exteriorly of the body in contact with the windshield 20. Cooperative with plunger 19 and more particularly with an annular groove 19b formed in the peripheral surface of the plunger are two detent units 21 which maintain the fuse in unarmed position until the projectile has traveled a predetermined distance during its flight. The detent units are in lateral bores 22 which extend

from the bore 5 to the outside surface of the body. Each detent unit comprises a ball 23 and a compression spring 24 retained in the lateral bore by means of set screws 25. A hemispherical recess formed in the opposite end 19a of plunger 19 receives one end of an armature actuating rod 26 which extends inwardly of the bore 5 and terminates in a spherical member 27 in contact with cam surfaces 15. Intermediate the ends of rod 26 there is formed thereon a frangible disk or rod 28 locked in the bore 5 against a shoulder 5a by means of a lock ring 29. A spring 30 which biases the rod 26 towards the armature is mounted concentric with rod 26 and is confined in bore 5 between shoulder 5b of bore 5 and frangible disk 28.

When the projectile is fired the detents move radially outward, due to centrifugal force, and place the fuse in armed condition. Upon impact of the projectile with a target, the plunger is driven inwardly of the body and in turn drives the rod 26, the spherical end of which then engages the cam surfaces of the armature, causing the armature to oscillate and the magnetic lines of force of the armature to induce an electric current in the electromagnetic winding. The current thus generated passes through the detonator to function it which in turn functions the booster and subsequently the explosive charge. In the event that plunger 19 becomes jammed in bore 5, the frangible disk will release the armature actuating rod 26 to permit the spring to drive the spherical end of the member through the longitudinal bore 14 and rock the armature.

In the embodiment of the invention shown in Fig. 3, the end 19a of plunger 19 is extended inwardly of the fuse body and provided with an arm 31 radially thereof. The free end of the arm has a stud 32 formed thereon in sliding engagement with the surfaces of a slot 33 formed in arm 35 of a velocity multiplying lever 36. The velocity multiplying lever 36 is pivotally mounted on a plate 38 fastened to one wall of the chamber 6. The lever comprises two arms 35 and 37, the lengths of which may be in any desired ratio to impart to the permanent magnet armature 40, of an electrical generating means 39, a linear velocity in excess of the linear velocity obtained by the plunger at the time of impact. Arm 37 has formed in its free end a slot 41 in which is positioned a stud 42 projecting from an extension 40a of the armature 40. The armature 40 is thus held in position for longitudinal movement through aperture 44 of the electromagnetic field winding 43, upon impact of the projectile with a target. The winding 43 is affixed to the wall of the chamber 6 above the arm 37 by any convenient means. The leads 43a and 43b connect the field winding with the electrical detonator 9. An electric current induced by the lines of force of the armature as it is driven through the aperture 44, actuates the detonator 9. A shear pin 45 in engagement with the body and plunger prevents the plunger from creeping during flight of the projectile.

Fig. 4 illustrates another form of the invention wherein the plunger 19 has affixed to its end 19a a magnetic member 46. The electromagnetic field winding 47 is positioned in chamber 6 with its perforation 48 in axial alignment with the plunger 19. The winding is retained in chamber 6 by means of the locking ring 7a and is connected to the electric detonator 9 by means of leads 49 and 50. In operation the plunger is driven through the aperture 48, exciting the field winding and causing an electric current to flow through the leads 49 and 50 and the detonator.

Fig. 5 shows another modification of the fuse including a vibrating magnetic reed type of electric generator 51 mounted in a wall of the chamber 6. The generator 51 comprises a U-shaped iron core 52, a winding 53 thereon and a magnetized reed 54 having its fixed end fastened to the center of the iron core and its free end extending between and beyond the extremities of the legs 55—56 of the core 52. The plunger 19 extends beyond the reed and into a perforation 57 of a cup-shaped closure member 58 in the open end of chamber 6. The plunger 19 is provided with a groove 59 in which the free end of the reed is inserted. The plunger is driven inwardly of the body upon impact of the projectile with

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a target and bends the reed until it snaps out of the groove, whereupon the reed vibrates between legs 55 and 56 to change the flux linkages in the winding and induce an electric current therein to actuate the detonator 9 connected to the winding 53 by leads 60 and 61.

It will be apparent that the embodiments shown are only exemplary and that various modifications can be made in construction and arrangement within the scope of the invention as defined in the appended claims.

I claim:

1. A point detonating fuse for explosive projectiles, comprising a body member having a conically shaped nose, a chamber formed in the base of said member, a windshield affixed to the nose and extending forwardly thereof, said member provided with a longitudinal bore therethrough in communication with the chamber, a plunger slidably fixed in the bore, one end of the plunger extending exteriorly of the nose in contact with the windshield, a shoulder formed in the walls of said bore adjacent other end of said plunger, a spring biased permanent magnet pivotally mounted in the chamber and provided with cam surfaces formed in a longitudinal bore thereof in axial alignment with the plunger, an electromagnetic field winding fixed in the chamber and surrounding the longitudinal sides of the magnet, a booster having an electrical detonator therein positioned in the chamber adjacent the field winding, electrical conductor means connecting the detonator and field winding, a rod slidably fixed in said longitudinal bore intermediate said armature and said plunger, one end of said rod in contact with the said other end of the plunger, the opposite end of said rod being spherical in shape and in contact with said cam surfaces, the plunger upon impact with a target being driven inwardly of said member to drive the rod and cause its spherical end to traverse the cam surfaces and thereby rock the pivoted magnet, said magnet thereupon inducing an electric current in said field winding to function the detonator.

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2. The invention in accordance with claim 1 and means to prevent malfunction, said means comprising a frangible disk affixed to the rod intermediate its ends, the peripheral edge of the disk affixed to the walls of the first mentioned longitudinal bore, and a compression spring concentric with said bar between said disk and said shoulder, said disk severable upon impact to permit said spring to drive the rod rearwardly and oscillate the pivoted magnet.

3. A fuse for explosive missiles, comprising a body member having a longitudinal bore therethrough in communication with a chamber in the base of the body, target contact means slidably fixed in the bore and partially extending exteriorly of the body, a shoulder formed in the walls of said bore adjacent said target contact means, electric generating means in the chamber, an electric detonator connected to the generator, a plunger in said bore having one end in releasable contact with the target contact means and its opposite end operatively engaging the electric generating means, a frangible support affixed in the walls of said bore and to said plunger intermediate its ends, a driving spring concentric with said plunger between the frangible support and said shoulder, the target contact means causing the frangible member to release the plunger under pressure of the spring to function the electric generating means regardless of the angle of impact with a target.

References Cited in the file of this patent

UNITED STATES PATENTS

384,682 Zalinski June 19, 1888

FOREIGN PATENTS

506,280 France May 26, 1920
525,333 Great Britain Aug. 27, 1940